MYP/3D Science Unit Planner

Marietta City Schools

Grade & Course: Physics	**Topic:** Electricity Magnetism	**Duration:** 4 weeks
Teachers: Physics PLC Teachers		

Georgia Standards and Content:

SP5. Obtain, evaluate, and communicate information about electrical and magnetic force interactions.
a. Develop and use mathematical models and generate diagrams to compare and contrast the electric and gravitational forces between two charged objects.
b. Plan and carry out investigations to demonstrate and qualitatively explain charge transfer by conduction, friction, and induction.
c. Construct an explanation based on evidence of the behavior of charges in terms of electric potential energy.
d. Plan and carry out an investigation of the relationship between voltage, current, and power for direct current circuits. (Clarification statement: Application of Ohm's Law to different circuit configurations, not limited to parallel and series, and calculations of equivalent resistance are expected.)
e. Plan and carry out investigations to clarify the relationship between electric currents and magnetic fields. (Clarification statement: This includes coils and their importance in the design of motors and generators.)

Narrative / Background Information

Prior Student Knowledge: (REFLECTION – PRIOR TO TEACHING THE UNIT)

From 8th grade Physical Science
Basic knowledge of static compared to current electricity.
Basic knowledge of current and sources of voltage.
Prior experience solving basic Ohm's Law calculations.

Year-Long Anchoring Phenomena: (LEARNING PROCESS)

The laws of physics dictate the interactions of our physical world.

Unit Phenomena (LEARNING PROCESS)

Electrical power is one of the most efficient methods for transporting energy.

MYP Inquiry Statement:

The movement of electrons can be modeled by examining specific relationships, allowing for transmission of information.

MYP Global Context:

Scientific and Technical Innovation

Approaches to Learning Skills:	**Disciplinary Core Ideas: (KNOWLEDGE & SKILLS)**	**Crosscutting Concepts: (KNOWLEDGE & SKILLS)**
Research Skills Thinking Skills Collaboration Skills	Electricity Circuits Magnetism	Cause & Effect (CC) Stability & Change (CC & MYP) Systems & System Models (CC & MYP) Patterns (CC)

Communication Skills	Static Electricity Voltage Resistance	**MYP Key and Related Concepts:** Scale, Proportion & Quantity (CC) Matter & Energy (MYP/CC) Stability & Change (CC) **Related Concepts:** Energy & Interactions

Possible Preconceptions/Misconceptions: (REFLECTION – PRIOR TO TEACHING THE UNIT)

Direction of current flow. Students generally understand that it is electrons moving but do not understand the current flow is in the direction of positive charges moving.
Misconception: Adding resistor into a circuit will always increase the total resistance (even in parallel).
Difference between current and voltage.
Voltage division between series and parallel circuits.
Direction of magnetic fields form from electrical currents.

Key Vocabulary: (KNOWLEDGE & SKILLS)

- Electricity
- Circuits
- DC and AC current
- Magnetism
- Static Electricity
- Voltage
- Resistance

Inquiry Questions:

Factual

What is Ohm's Law?
What direction does electrical current flow?
What is voltage?
What is resistance?
What is formed when charges move?
What are the units for current, voltage, and electrical power?

Conceptual

What is the difference between AC and DC current?
What is the difference between series and parallel circuits?
How is total resistance calculated in a series or parallel circuit?
How is electrical power calculated?

What is the direction of a magnetic field formed due to an electrical current?

Debatable

Should our country use AC or DC current as the bases of our power grid?

MYP Objectives	**Summative assessment**	
MYP A MYP B MYP C	Formative Ohm's Law Lab: MYP B+C Formative Series/Parallel Circuit Lab: MYP B+C Summative MYP B+C Lab Electricity and Magnetism Test: MYP A	Relationship between summative assessment task(s) and statement of inquiry: The assessment measures how well students can determine how electrical current divides between resistors and how magnetic fields can be formed to transmit information.

Unit Objectives: Electicity and Magnetism Need to Know - https://docs.google.com/document/d/1gCz52Xq9SCX1Kj4KFuCUH4gH5-zRSvcu9VrtZ-K8k5Q/edit?usp=sharing

Learning Activities and Experiences	**Inquiry & Obtain: (LEARNING PROCESS)**	**Evaluate: (LEARNING PROCESS)**	**Communicate: (LEARNING PROCESS)**
Week 1:	Students discover the methods of charging and production of static electricity through a rotation lab. Students explore static electricity using a comb and paper, balloon and hair, and a Van De Graaff generator.	Students identify methods of charging in each scenario and examine how to increase the static charge.	Students create whiteboards showing their findings to be used in a gallery walk.

Week 2:	Students will examine current in a circuit when increasing the voltage applied to a resistor and light bulb.	Students will calculate and use graphical analysis to determine the resistance of the resistor and the light bulb. Students will compare the graphs of a resistor (ohmic) with the light bulb (non-ohmic).	Student groups will explain their graphs to another group through the lens of Ohm's law.
Week 3:	Students will build a circuit using a power supply, wires, 5 light bulbs, and a switch. Circuits must cause all bulbs to light up, include both series and parallel circuits, and should produce maximum brightness.	Students will calculate the electrical power (watts) used by each light bulb to predict total brightness.	Students will demonstrate their final circuit to the teacher and a peer group. They will explain why they chose their set up and show an electrical power calculation.
Week 4:	Students will observe an AC generator using the pHET simulation. Students will discover direction of the magnetic field compared to current flow, how to maximum current from a changing magnetic field, and how to maximize electrical power transferred wireless between coils of wire.	Students will record how changing the location of loops, loop area, rotational velocity of a magnet, etc affect the electrical power produced and transferred.	Students create a labeled diagram of an AC hydro-electric generator on a white board and explain 3 methods for increasing the electrical power output.
Week 5: Remediation	Students complete a review quiz to diagnose strengths and weaknesses in the content.	Students complete review activities based upon quiz results.	

Resources (hyperlink to model lessons and/or resources): (click here for description)

Electricity and Magnetism Schoology Unit: https://marietta.schoology.com/group/1606049999/materials#/group/1606049999/materials?f=63016867

pHET AC generator simulation: https://phet.colorado.edu/en/simulation/legacy/generator

Reflection: Considering the planning, process and impact of the inquiry

Prior to teaching the unit	During teaching	After teaching the unit